What determines individuals' preferences for colorectal cancer screening programmes? A discrete choice experiment.

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Abstract

Introduction: In many countries uptake of colorectal cancer (CRC) screening remains low.

Aim: To assess how procedural characteristics of CRC screening programmes determine preferences for participation and how individuals weigh these against the perceived benefits from participation in CRC screening.

Methods: A discrete choice experiment was conducted among subjects in the age-group of 50 – 75 years, including both screening-naïve subjects as well as participants of a CRC screening programme. Subjects were asked on their on preferences for aspects of CRC screening programmes using scenarios based on: pain, risk of complications, screening location, preparation, duration of procedure, screening interval and risk reduction of CRC related death.

Results: The response was 31% (156/500) for screening-naïve and 57% (124/210) for CRC screening participants. All aspects proved to significantly influence the respondents' preferences. For both groups combined, respondents required an additional relative risk reduction of CRC related death by a screening programme of 1% for every additional 10 minutes of duration, 5% in order to expose themselves to a small risk of complications, 10% to accept mild pain, 10% to undergo preparation with an enema, 12% to use 0.75 litres of oral preparation combined with 12 hours fasting and 32% to use an extensive bowel preparation. Screening intervals shorter than 10 years were significantly preferred to a 10-year screening interval.

Conclusion: This study shows that especially type of bowel preparation, risk reduction and length of screening interval influence CRC screening preferences. Furthermore, improving awareness on CRC mortality reduction by CRC screening may increase uptake.

Keywords

Colorectal cancer, screening, FOBT, endoscopy, preferences, discrete choice experiment

Introduction

Colorectal carcinoma (CRC) is the second most frequently occurring malignancy in the European Union, and the second leading cause of cancer related death in the Western world. (1) A recent study demonstrates that for many European countries CRC mortality rates are decreasing while incidence is rising, suggesting an increasing CRC prevalence. (2) CRC screening is effective in reducing CRC mortality. (3-11) Screening can reduce CRC mortality by early detection of CRC and endoscopic removal of premalignant precursors of CRC (adenomas). (5;11;12) There are several methods available for CRC screening. The various types of faecal occult blood tests (FOBTs) primarily aim at the early detection of CRC, whereas endoscopic and radiologic screening tests (flexible sigmoidoscopy (FS), colonoscopy) are effective at both early detection and removal of premalignant lesions. (12) Different screening methods are expected to have a different impact on CRC mortality reduction due to these differences in preventive potential. CRC screening methods also differ with respect to procedural characteristics, which determine the subject's burden of a screening method. CRC screening methods perceived as the most burdensome (FS, colonoscopy) also have the largest potential for prevention of CRC. (12) Currently, insufficient evidence is available to recommend one screening method over another.

Attendance is an important determinant of the effectiveness of CRC screening programmes. Uptake of CRC screening in a pilot screening programme in the Netherlands has remained lower than uptake of breast and cervical cancer screening. (13-15) In many other countries, uptake of CRC screening, as well as continuing adherence to CRC screening, has also remained suboptimal. (3;4;13;16-18) It has been established that increasing colorectal cancer screening uptake, in comparison with other targets, has a large potential for reducing CRC related mortality. (19) Attendance rates depend on the willingness of individuals to undergo a certain screening test. This willingness may be influenced by perceived advantages and drawbacks of CRC screening tests and furthermore, by knowledge and awareness of CRC, CRC risk and CRC screening (18;20;21). Individuals may be willing to undergo a screening test despite several drawbacks in order to maximize health benefit or vice versa (to accept a lower health benefit in order to avoid several burdensome test characteristics). To optimise a CRC screening programme it is of paramount importance to gain insight in factors that influence population preferences for CRC screening programmes, and the trade-offs individuals are willing to make between benefits and drawbacks of a CRC screening programme.

Research has shown that patient preferences can have a major impact on their willingness to use services and furthermore, there is an increasing emphasis on involvement of patients in health care decisions. (22)

This study therefore investigated preferences for CRC screening using a discrete choice experiment (DCE). DCE is a survey methodology with its origin in market research. DCEs are widely used for the assessment of preferences in transport and environmental economics and marketing research. (23) They are increasingly used for health care purposes. (24;25)

It has been demonstrated that awareness of CRC and CRC screening in the Netherlands has remained low. (21) There is currently no organised CRC screening programme in the Netherlands, except for hereditary or familial CRC. A similar situation is encountered in many countries in the EU, in fact, only approximately 50% of the target population is offered any type of screening for CRC. It is of particular importance to study preferences in a screening naïve population, since they may guide the introduction and adjustment of new CRC screening programmes in these countries.

The aim of our study was to determine how procedural characteristics of various CRC screening methods determine preferences for participation, and how individuals weigh these against the expected health benefits from CRC screening. We compared the relative importance of aspects of the three most commonly used CRC screening tests: FOBT, FS and colonoscopy.

Materials and methods

Study population

We conducted the study in two groups. The first group included a total of 500 screening-naïve individuals aged 50-74 years old who were randomly selected from the population registry of the region Rijnmond in the Southwest of the Netherlands. The region includes Rotterdam and surrounding suburbs and harbours 338.000 inhabitants in the target age groups. The second group included 210 participants of a randomised screening trial for CRC in the Netherlands from the same target population as mentioned above. This screening trial invited average risk individuals to participate in a CRC screening programme with guiac-based FOBT (gFOBT), faecal immunochemical test (FIT) or FS. (13)

Invitation of subjects

Subjects were contacted by mail. They received a questionnaire and an information brochure with general and background information about CRC and CRC screening. Individuals could return the questionnaire in a postage-paid self-addressed envelope that was included in the mailing package. A reminder was sent four weeks later in case of non-response.

DCE

DCE is a formal technique to assess preferences, assuming that a healthcare intervention (e.g. a screening programme) can be described by its characteristics (attributes; e.g. test duration). (26) Those attributes are further specified by variants of that attribute (levels; e.g. for test duration: 10, 20, 30 minutes). The DCE assumes that the individual preference for a test is determined by the levels of those attributes. (26) Individuals are presented with a number of choice sets containing several scenarios (screening programmes). Those programmes are described by several attributes with varying levels (Figure 1). The results of a DCE provide information on the relative importance of the attributes and the trade-offs individuals are willing to make between these attributes. The DCE design will be explained in more detail further on.

Attributes and attribute levels

The attributes and attribute levels of the DCE were derived from literature review, expert opinions, interviews with screening naïve (n=10) and screened (n=10) individuals of the target population. In the interviews we asked individuals to point out which of these attributes they expected to be important or had been important in their decision to participate in a CRC screening programme. The attributes identified as most relevant were: pain, risk of complications, location of the screening test, preparation for the procedure, duration of the procedure, screening interval and risk reduction of CRC related death (Table 1). Attribute levels were derived from the literature. The levels for each attribute incorporated the range of characteristics or possible test outcomes of all different screening methods (FOBT, FS and colonoscopy). The attribute 'interval' was related to a CRC screening programme, the other attributes were test-related.

Study design and questionnaire

The design contained three attributes with two levels and four attributes with four levels. The combination of those attributes and levels resulted in 2048 (i.e. 2^3*4^4) possible test scenarios. Since it is not feasible to present a single individual with all these scenarios, we reduced the model to 16 scenarios (a fractional factorial design) by means of a website, containing a library of orthogonal arrays. (27) These 16 scenarios were used to create 16 choice sets. Each choice set contained two screening programmes and an opt-out (the option to choose 'no screening', see figure 1). A special technique (fold-over; (28)) was used to create the second programme of each choice set. As a result, our design was an efficient orthogonal design; there was no correlation between any pairs of attributes (orthogonality), all levels of each attribute were represented in the same frequency (level balance), and similar levels of an attribute did not occur within the same choice set (minimal overlap). A rationality test was included in the DCE to investigate the understanding of the questionnaire. This was a choice set of which one screening programme was logically preferable over the other given the attribute levels.

The questionnaire further contained questions on background variables (e.g. generic health status (EQ-5D; (29))) and a question assessing experienced difficulty of the questionnaire (5-point scale). A written description of the attributes and levels was given at the beginning. We conducted a

pilot study (n=20) to ascertain respondents could manage the length of the questionnaire and to examine the intelligibility, acceptability and validity of the questionnaire.

The study was approved by the Medical Ethical Committee of the Erasmus MC (MEC-2007-224).

Analyses

Each choice between three options (two screening programmes and the opt-out) was considered as a specific observation. A multinomial logit model was used to analyse the data. We excluded individuals who answered less than 13 questions of the DCE.

We assumed that there was no linear relationship between the different levels of the attributes 'preparation' and 'screening interval' and that all attributes had independent effects on preferences. On this basis, we estimated the following model for the DCE:

$$U = V + \varepsilon = \beta_0 + \beta_{1\ pain} + \beta_{2\ complications} + \beta_{3\ location} + \beta_{4\ enema} + \beta_{5\ 0,75lfluid} + \beta_{6\ 4lfluid} + \beta_{7\ duration} + \beta_{8\ interval2} + \beta_{9\ interval5} + \beta_{10\ interval10} + \beta_{11\ mortalityreduction} + \varepsilon$$

U represents latent utility of a CRC screening alternative in a choice set. It is assumed that an individual will choose the CRC screening alternative which maximises his/her utility amongst all alternatives in a choice set. V is a systematic, explainable, component specified as a function of the attributes of the CRC screening alternatives. ε is the random (unexplainable) component representing unmeasured variation in preferences. The constant term (screening programme; β_0) is an 'alternative specific constant' and indicates the relative weight individuals place on screening programmes compared to no screening. β_1-β_{11} are coefficients of the attributes indicating the relative weight individuals place on a certain attribute(level). The value of each coefficient represents the importance respondents assign to a certain level. However, different attributes utilise different units of measurement. For example, the coefficient for 'risk reduction of death from CRC' represents the importance per relative 10% risk reduction. When looking at a screening programme that generates a 50% risk reduction, the coefficient should be multiplied five times in order to enable comparison to the coefficients of other levels. An attribute with a two sided p-value smaller than 0.05 was considered to be important in the decision to participate in a certain screening programme.

Given the current DCE literature (30;31), further sensitivity analyses were conducted to explore the impact of excluding respondents who failed the rationality test by removing such individuals from the sample and rerunning the analysis.

The trade-offs respondents were willing to make between the attributes were calculated by the ratios of the coefficients of the different attributes with risk reduction as the denominator. For example, β_1/β_{11} indicates how much additional relative risk reduction respondents think a test should generate in order to undergo a test that causes mild pain instead of a test that causes no pain.

To examine the expected uptake of CRC screening based on our results, we applied the model as presented by Gerard and colleagues and Hall and colleagues to our data. (32;33)

$$P_{participation} = \frac{1}{(1+e^{\wedge -V})}$$

The model assumes that a preference score of 0 indicates that individuals have an equal preference for either participation or non-participation, hence the expected participation rate equals 50%. Additionally, we investigated the effect of changing the most important CRC screening programme characteristics, as identified by the results of our multinomial logit model, on the expected uptake of CRC screening. The average probability of participation was calculated by entering the constant term (β_0) into the model as described above.

The expected uptake of the different screening tests was calculated by adding up the different levels corresponding with the screening test concerned, and entering this value into the model. The levels we applied for assessing the uptake of FOBT were ‘no pain’, no risk of complications, location ‘at home’, no preparation and a duration of 15 minutes. For FS we applied ‘mild pain’, a small risk of complications, location ‘hospital’, preparation by an enema and a duration of 30 minutes. For colonoscopy we used ‘mild pain’, a small risk of complications, location ‘hospital’, preparation by ‘drinking of 4 litres of fluid and a duration of 90 minutes.

The influence of the different levels on expected uptake was calculated by entering the coefficients of the levels, added to the constant term, into the model.

Aggregate data on socio-economic status (SES) were available at the level of the respondents’ area zip code, weighted by the number of inhabitants per postal code and classified into three groups (high, average, low).

Characteristics of the different groups were compared using parametric and non-parametric tests. For categorical data, we used Chi-square and Fisher Exact Test to test for differences between

screening naïve individuals and CRC screening participants. For continuous variables, we used the Independent Samples T-Test. To assess whether there were differences in preferences among participants of the FOBT (either gFOBT or FIT) and FS screening programme and those with and without endoscopy experience, we performed subgroup analyses. For comparing subgroups, we included all respondents in the same model and used the subgroup as interaction term.

Results

Respondents

The response rate was higher among CRC screening participants (59%; 124/210) compared to screening naïve individuals (31%; 156/500) (Table 2). The characteristics of the respondents are shown in Table 2. Among the screening naïve group, 22% had undergone an endoscopy in the past. Within the group of CRC screening participants, 53% had previous endoscopy experience including 22% (16/72) of FOBT screenees and logically all FS screening subjects (48/48).

DCE results

Forty-three percent of the screening-naïve individuals and 50% of the CRC screening participants rated the questionnaire as 'easy' (p=0.24).

The signs of all coefficients of the attributes were consistent with our initial hypotheses (see Table 3). The positive sign given to the coefficient 'risk reduction of death from CRC' indicated that respondents preferred a test generating a higher risk reduction over a test that generates a lower risk reduction. The positive sign of the coefficients for shorter screening intervals indicated that individuals preferred those screening intervals over screening once every 10 years. The negative signs for all other attributes indicate that individuals preferred a screening test of shorter duration, with no preparation, no pain and no risk of complications.

The non-significant coefficient of the constant term in the screening-naïve group indicated that these subjects had, if assuming a screening programme with the reference level for all the attributes, no preference for either screening or no screening whereas the group of CRC screening participants expressed a positive attitude towards screening compared to no screening (positive significant coefficient). All screening attributes proved to be important determinants of the preferences in each of the respondent groups, except for location of the screening test, which only significantly influenced preferences of CRC screening participants and not those of the screening naïve individuals and a preparation with '0.75 litres of fluid and 12 hours fasting', that did not influence preferences of CRC screening participants.

The results of the sensitivity analyses indicated that removing respondents who failed the rationality test did not entail drastic changes in the outcomes of those analyses. We therefore included them in our further analyses.

The differences in preferences *between* screening naïve-individuals and participants of a CRC screening programme were statistically not significant, except for preferences regarding risk reduction of CRC related death. Screening naïve individuals demanded more effectiveness from a CRC screening programme compared to participants ($p<0.01$). We performed subgroup analyses, analysing FOBT and FS screenees separately, which showed that participants of FOBT and FS screening did differ in preferences: FS screenees expressed a positive attitude, while FOBT screenees expressed a negative attitude towards a test in the hospital ($p<0.001$). Furthermore, FS screenees attached more importance to a 5-yearly screening interval ($p=0.01$) and to the effectiveness of a screening test ($p<0.001$) than FOBT screenees.

When comparing those with previous endoscopy experience to those without endoscopy experience, it could be seen that pain had a significant greater influence on preferences for those without previous endoscopy experience ($p=0.02$). The location hospital was negatively associated with preferences for those without endoscopy experience, but it had a positive affect on preferences for those who had undergone a previous endoscopy (difference: $p<0.01$). Individuals without endoscopy experience also demanded more effectiveness from a screening test ($p<0.01$).

Screening-naïve individuals and CRC screening participants significantly preferred no preparation to all other preparations (p-values <0.03). Both groups significantly preferred preparation with an ‘enema’ or ‘0.75 litres of fluid’ instead of a preparation with ‘4 litres of fluid’ (p-values <0.001). Preparation with an ‘enema’ and ‘0.75 litres of fluid’ were valued equally by both groups (p-values>0.09).

Trade-offs

It can be seen in Table 4 that, based on the expressed preferences, screening-naïve individuals required an additional relative risk reduction of 30% (95% confidence interval (CI) 24-37%) for participation in a screening programme with a test requiring a preparation with ‘4 litres of fluid and 18 hours fasting’ instead of a test that required ‘no preparation’. Respondents preferred shorter screening intervals and they were willing to give up a 12% (CI 7-18%) relative risk reduction if the screening interval was *shortened* from once every 10 years to a 2-yearly screening interval. Participants of a CRC screening programme made trade-offs that were comparable to those of the screening naïve individuals.

Expected uptake of CRC screening

The average expected uptake of CRC screening was 56% (CI 50 - 62%) for screening naïve individuals. Assuming that all screening tests would generate a 10% risk reduction of CRC related death, uptake would be 72% for biennial FOBT screening, 46% for 5-yearly FS screening and 22% for 10-yearly colonoscopy screening. We would expect that, if individuals are aware of the achievable risk reduction as currently known from the literature, the uptake would increase to 75% for biennial FOBT screening, 80% for five-yearly FS screening and 71% for 10-yearly colonoscopy screening (risk reduction of CRC related death respectively 16% (34), 59% (5) and 74.5% (35)). The effects of changing the CRC screening programme characteristics on average expected uptake of CRC screening are shown in Figure 3.

Discussion

Our study demonstrates the importance of several procedural characteristics of CRC screening programmes for the preferences of potential and actual screenees: risk reduction of CRC-related death, preparation for the procedure, procedure related pain and complications and screening interval. To optimise a screening programme, the attendance rate should be high. A high attendance rate is only possible when the utilised screening strategy and the information given connect with the preferences of the target population. The results of this DCE in the first place indicate targets for improvement of CRC screening programmes. Secondly they stress the importance of several aspects of screening programmes regarding the information provided to screening invitees. To our knowledge, this is the first study assessing preferences for CRC screening among both screening-naïve subjects and CRC screening participants.

In our study, especially mortality reduction had an important positive influence on preferences for CRC screening methods. A few other studies have investigated preferences for CRC screening using a DCE. (36-41) Our finding that individuals attach much importance to CRC mortality reduction by a screening method is consistent with the results of previous studies. (36;41;42) The finding that individuals are prepared to undergo more burdensome screening tests if this results in sufficient additional risk reduction of CRC related mortality demonstrates that they trade benefits and harms of a screening test.

The burden of the required preparation was considered the main drawback of undergoing CRC screening. A preparation commonly used for colonoscopy (i.e. drinking 4 litres of fluid and 18 hours fasting) would only be chosen when an additional relative risk reduction of, on average, 33% would be achieved. In line with our results, Canadian investigators found that preparation was ranked as the most important process related attribute. In contrast, American investigators found that preparation was rated as the least important attribute. (37) The levels that were chosen for the attributes may explain those differences. The results of our DCE are of utmost importance when for example starting a colonoscopy screening programme with a burdensome preparation. Emphasis should be laid on adequate information that should be provided to the target population about the burden and benefits including expected CRC mortality reduction by colonoscopy screening, since this may compensate for a burdensome preparation.

Interestingly, we found that respondents significantly preferred shorter screening intervals to a 10-year screening interval irrespective of health benefit. This finding is consistent with a previous study suggesting that women preferred shorter (annual and biennial) over longer (3-, 4- or 5-year) screening intervals for cervical cancer screening. (43) One study among Danish individuals and another among both American and Canadian individuals could not confirm preferences for shorter CRC screening intervals. (36;40) A second American study could not determine if individuals preferred shorter or longer screening intervals. (37) Several studies have showed that reassurance may be a motivation for and/or a result of undergoing cancer screening. (44;45) The preference for shorter screening intervals found in our study may be associated with expected reassurance. This again stresses the importance of adequate information provided to potential screenees. It emphasises the need to adequately inform individuals that longer screening intervals for CRC screening do not imply lower reductions in mortality, but that specific CRC screening tests with longer screening intervals have more potential for CRC prevention and therefore require less frequent testing.

There were some differences in preferences between FOBT and FS screenees. Assessment of preference variations across subgroups is advisory because of status quo bias; in other words the tendency of people to value services higher once they have experienced them. (46) We conducted the study among both screening-naïve individuals and individuals who had prior experience with CRC screening tests, so that we were able to investigate if status quo bias was present. The preferences of screening-naïve subjects and CRC screening participants were not significantly different. The fact that FOBT screenees expressed a negative attitude towards a test in the hospital, while FS screenees expressed a positive attitude towards a test in the hospital may be explained by the phenomenon of status quo bias. However, it may also be a result of selection bias; that those subjects with a preference for the location ‘home’ do not participate in FS screening and vice versa. Interestingly, the same significant difference regarding the influence of screening location on preferences was observed when comparing those with endoscopy experience to those without. A possible explanation might be that individuals on beforehand have a negative association with the location hospital, but develop a positive attitude towards a hospital-based examination once they have experienced it.

Research has consistently shown that expected pain is one of the most important reasons for declining the endoscopic screening offer. (18;47;48) The results from our study confirm that finding and furthermore they demonstrate that pain has significant less influence on preferences of those with

endoscopy experience, suggesting that pain actually experienced during endoscopic screening is not as severe as expected on beforehand.

This study revealed uptake levels of the FOBT, FS and colonoscopy based on the characteristics in our model. The uptake levels for FOBT and FS as predicted by our model are somewhat higher than observed in the Dutch screening trial conducted in the same target population (13), however participants in this trial were not informed on achievable risk reduction of CRC related death and the required frequency of testing for FOBT and FS which have both shown to positively influence CRC screening preferences. We found that mainly risk reduction of CRC related death highly influenced the participation that could be expected for the different screening tests, suggesting that increasing awareness on efficacy of the screening tests might enhance uptake.

Given the low levels of awareness of CRC screening in the Netherlands, it may be of vital importance to raise knowledge on achievable risk reduction of CRC related death in order to increase screening uptake especially for the more effective endoscopic screening tests. The importance of awareness on efficacy of the available screening tests is further underlined by data of a Swiss study, in which 75% of all screenees chose to undergo a colonoscopy and only 25% preferred FOBT or FS screening after they were informed about the efficacy of all screening methods (49).This study involved testimonies from patients with CRC in their campaign in order to raise CRC awareness. This strategy has also been used in various other campaigns throughout the European Union, among others in the United Kingdom, Germany and the Netherlands. CRC patients and their relatives may be important advocates for raising awareness, and possibly also for increasing public familiarity with endoscopic screening which has been demonstrated to influence CRC screening preferences in our study.

There are some limitations to our study. There was a significant difference in response rate between screening-naïve individuals and CRC screening participants. This may have given a selection bias and thereby be a limitation regarding the interpretation of our results.

Furthermore, the way we framed the information on risk reduction may have influenced our results. In order to minimise framing effects we attempted to frame our information, where possible, according to the current literature. (50)

In conclusion, individuals are willing to trade-off benefits and harms of CRC screening programmes. Especially type of bowel preparation, length of screening interval and mortality reduction

influenced individuals' trade-offs. The results provide insight in the decision-making process regarding the decision to participate in a CRC screening programme. This information can be used to improve information provided to CRC screening invitees, and identify targets for increasing participation rates.

Conflict of interest statement

None declared.

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Table 1: Attributes and levels for colorectal cancer (CRC) screening

Attributes and levels	Beta coefficients in regression analysis
Pain	
No pain *(reference level)*	
Mild pain	β_1
Risk of complications	
None *(reference level)*	
Small	β_2
Location	
At home *(reference level)*	
Hospital	β_3
Preparation	
None *(reference level)*	
Enema. no fasting	β_4
Drinking of 0.75 litre of fluid. 12 hours fasting	β_5
Drinking of 4 litres of fluid. 18 hours fasting	β_6
Duration	
10 minutes	β_7
30 minutes	
60 minutes	
90 minutes	
Interval	
1x in 10 years *(reference level)*	
2x in 10 years	β_8
5x in 10 years	β_9
10x in 10 years	β_{10}
Risk reduction of death from CRC	
3% $\rightarrow$ 2.7% (10% relative risk reduction)	β_{11}
3% $\rightarrow$ 1.8% (40% relative risk reduction)	
3% $\rightarrow$ 1.2% (60% relative risk reduction)	
3% $\rightarrow$ 0.3% (90% relative risk reduction)	

Table 2: Respondent characteristics

Characteristics	Screening naïve	Participants	Difference
Response (n respondents/n invited - %)	156/500 (31.0)	124/210 (59.0)	p<0.01
Analyzable questionnaires (n - %)	152 (97.4)	120 (96.8)	p=0.74
Age (mean – standard deviation (SD))	59.9 (5.7)	62.2 (6.4)	p<0.01
Gender (male; n - %)	74 (48.7)	59 (49.2)	p=0.94
Socio economic status (n - %)			p=0.49
High	78 (51.3)	53 (44.2)	
Intermediate	21 (13.8)	20 (16.7)	
Low	53 (34.9)	47 (39.2)	
Endoscopy experience (n - %)			p<0.01
Yes	33 (21.7)	64 (53.3)	
No	117 (77.0)	54 (45.0)	
Unknown	2 (1.3)	2 (1.6)	
Knowing someone affected by colorectal cancer (CRC) (n - %)			p=0.84
Yes	19 (12.5)	18 (15.0)	
No	115 (75.7)	88 (73.3)	
Unknown	18 (11.8)	14 (11.6)	
Generic health status (EQ-5D) summary score (mean - SD)	0.92 (0.11)	0.93 (0.12)	p=0.48

Table 3: Preferences of the screening naïve individuals and participants of a colorectal cancer (CRC) screening programme

Levels	Screening naïve		Participants	
	β-coefficient	95% confidence interval	β -coefficient	95% confidence interval
Constant (screening)	0.25	(-0.00 to 0.50)	0.62	(0.35 to 0.90)*
Pain				
No pain (ref)				
Mild pain	-0.31	(-0.42 to -0.20)*	-0.23	(-0.34 to -0.11)*
Risk of complications				
None (ref)				
Small	-0.16	(-0.28 to -0.05)*	-0.13	(-0.25 to -0.01)*
Location				
At home (ref)				
Hospital	-0.09	(-0.20 to 0.02)	-0.01	(-0.13 to 0.10)*
Preparation				
None (ref)				
Enema. no fasting	-0.37	(-0.57 to -0.16)*	-0.23	(-0.45 to -0.02)*
Drinking of 0.75 liter of fluid. 12 hours fasting	-0.51	(-0.72 to -0.29)*	-0.22	(-0.45 to 0.01)
Drinking of 4 liters of fluid. 18 hours fasting	-0.98	(-1.18 to -0.77)*	-0.88	(-1.10 to -0.67)*
Duration				
None				
Per 10 minutes spent in the screening process	-0.03	(-0.05 to -0.01)*	-0.03	(-0.06 to -0.01)*
Interval				
1x in 10 years (ref)				
2x in 10 years	0.28	(0.11 to 0.45)*	0.24	(0.06 to 0.42)*
5x in 10 years	0.40	(0.21 to 0.59)*	0.33	(0.13 to 0.53)*
10x in 10 years	0.33	(0.18 to 0.49)*	0.27	(0.10 to 0.44)*
Risk reduction of death from CRC				
None				
Per relative 10% risk reduction	0.32	(0.29 to 0.35)*	0.26	(0.24 to 0.29)*

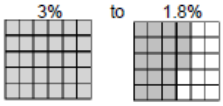
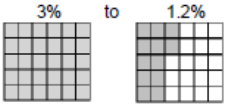
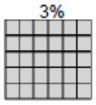
* significant at the 5% level
(ref) = reference level

Table 4: Individuals' tradeoffs between risk reduction and different aspects of a colorectal cancer (CRC) screening programme

Levels	Screening naïve	Participants	Interpretation note
	% of additional relative risk reduction respondents think a test should generate....		
Pain			
None (ref)			.. in order to undergo a test that causes mild pain instead of a test that causes no pain
Mild pain	10% (6-13%)	9% (4-13%)	
Risk of complications			
None (ref)			.. in order to undergo a test that carries a small risk of complications instead of a test with no risk of complications
Small	5% (1-9%)	5% (0-10%)	
Preparation			
No preparation (ref)			
Enema. no fasting	11% (2-5%)	9% (1-17%)	.. in order to accept a test that requires a preparation with one of these three methods instead of a test requiring no preparation at all
Drinking of 0.75 liter of fluid and 12 hours fasting	16% (9-23%)	8% (0-17%)	
Drinking of 4 liters of fluid and 18 hours fasting	30% (24-37%)	33% (25-41%)	
Duration			
None			.. in order to accept a test with an additional 10 minutes of duration compared to the standard duration
For each additional 10 minutes spent in the screening process	1% (0-2%)	1% (0-2%)	
Interval			
1x in 10 years (ref)			.. if the screening interval is lengthened from one of the shorter, more preferred, screening intervals (5-yearly, biennial, annual) to the longest screening interval (once every 10 years)
2x in 10 years	9% (3-14%)	9% (2-16%)	
5x in 10 years	12% (7-18%)	13% (5-20%)	
10x in 10 years	10% (5-15%)	10% (5-16%)	

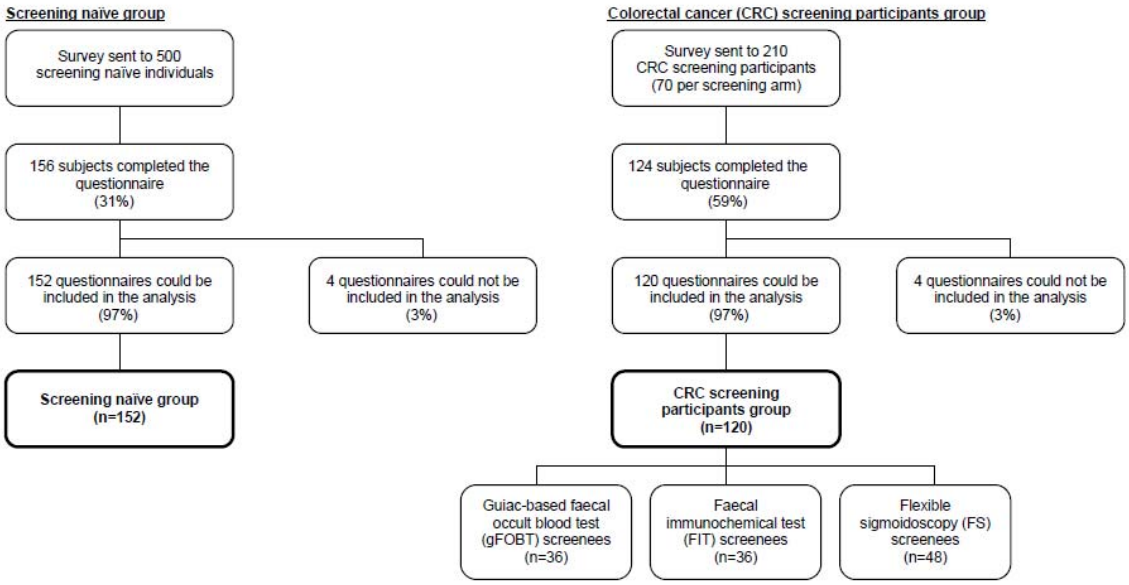
(ref) = reference level

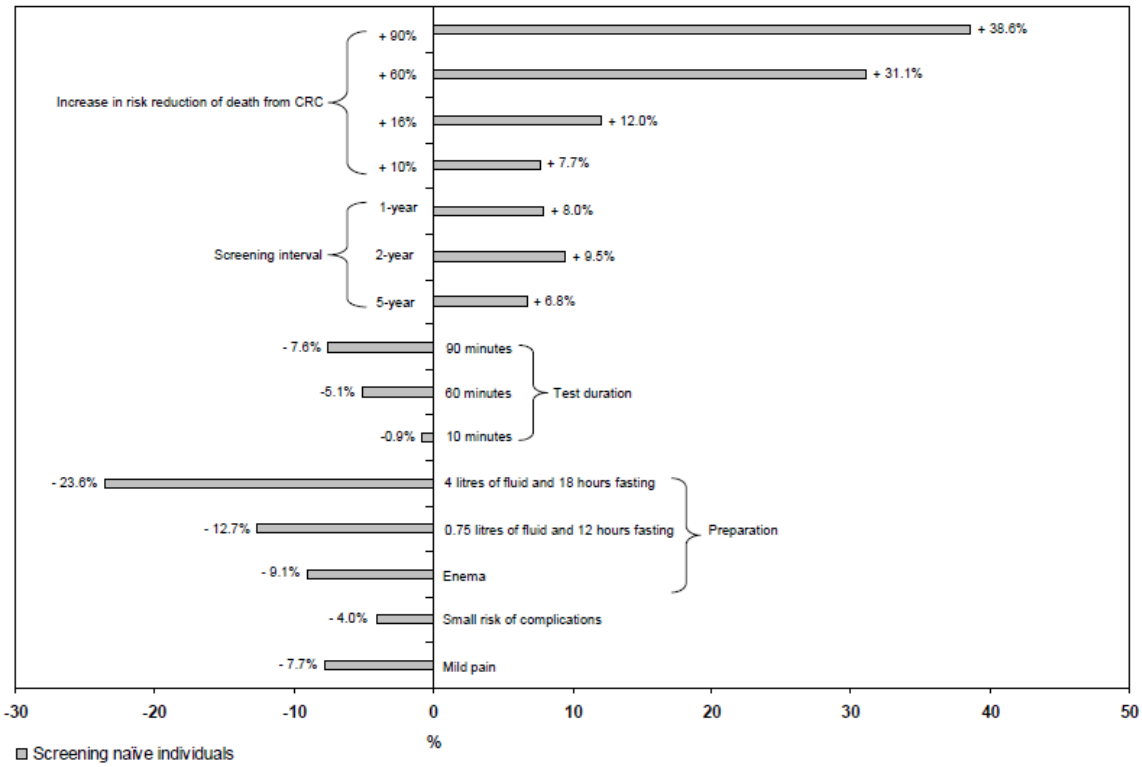
Figure 1: Choice set example

Choice options:	A	B	C
Preparation:	Enema, No fasting	Drinking of 0.75 liters of fluid, 12 hours fasting	None
Location:	At home	Hospital	None
Pain:	None	Mild pain	None
Risk of complications:	None	Small	None
The chance of dying from colon cancer decreases from:	3% to 1.8% 	3% to 1.2% 	3% 
In the following 10 years you will undergo the test:	5x	2x	0x
Duration:	30 minutes	60 minutes	None

Suppose screening for colon cancer is introduced.
Which test do you prefer? *(Fill in: A. B or C)*

Figure 2: Overview of subjects accessing the study





Effects of changing the screening programme characteristics on the average probability of participation in colorectal cancer (CRC) screening (56.2%), as predicted by the multinomial logit model.